

**Before the  
United States Department of Commerce  
National Telecommunications and Information Administration  
Washington, DC 20230**

United States Spectrum Management Policy  
For the 21<sup>st</sup> Century

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Docket No. 040127027-4027-01

**Comments of  
Delphi Corporation**

Donald R. Parshall, Jr. Esq.  
Delphi Corporation  
5825 Delphi Drive  
M/C 480-410-254  
Troy, MI 48098-2815  
(248) 813-2000

April 13, 2004

## SUMMARY

Delphi Corporation (“Delphi”) is a leading developer and manufacturer of vehicular radar systems in the United States. Using a variety of waveforms, Delphi’s vehicular radar systems, for example, helps to provide warning of potential obstacles or collision, automatically maintains a driver’s selected speed and distance behind a lead vehicle, and prepare the vehicle to lessen the severity of unavoidable accidents. They not only have the potential to help limit the impact of those accidents that do occur, but also to help reduce the numbers of highway accidents, and resulting deaths and injuries, that occur in the first place. Delphi has had a vehicular radar device that uses low power, “ultra-wideband” (“UWB”) techniques in production since June 2000.

Because of the unique and important safety benefits available from vehicular radar systems, Delphi maintains that the National Telecommunications and Information Administration (“NTIA”), as well as the Federal Communications Commission (“Commission”), should implement spectrum management policies that promote the development and deployment of these devices. Although authorized as unlicensed devices, vehicular radar systems should receive the highest priority and protection equal to what is provided to traditional public safety entities. It is not only police, fire and medical authorities that need spectrum to provide safety benefits to the public, but commercial and private entities as well. Moreover, frequency bands utilized by vehicular radar systems should be protected from future disruptions or dislocations that would create technical or economic uncertainty and threaten the widespread deployment of these devices.

Regarding the specific spectrum management reform proposals found in NTIA’s *Notice of Inquiry*, Delphi notes the potential benefits from consolidating government spectrum

management in a single organization, but cautions that such an organization would need to ensure that the appropriate discussion and balance is maintained. Delphi is concerned that public and private providers of public safety benefits be given sufficient access to exclusive or primary allocations. Delphi also believes that the United States is entering into a new era of spectrum use, with more emphasize on systems and machinery that will utilize spectrum for non-communications purpose. Vehicular radar systems are but one example. Consequently, the U.S. Government should ensure that traditional communications interests in spectrum does not stifle these new spectrum technologies. There is a need to conduct an analysis of what spectrum uses should receive high priority and protection. This analysis should consider that spectrum used for safety purposes, whether provided by public safety or private entities, should be at the top of such a list. Delphi also believes that spectrum auctions are not generally in the best interest of the general public and should be eliminated except in limited, commercial spectrum use.

To streamline testing and deployment of new spectrum technologies, candidate equipment may be tested for compatibility on an incumbent's service equipment under controlled conditions. Such compatibility testing should also be done in accordance with government-established test criteria and methods. Moreover, incumbents, including unlicensed incumbents, should be given due consideration and protection, especially where safety and environmental protection applications are implicated. The treatment of unlicensed devices, such as vehicular radar systems, needs re-examining.

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The Delphi Corporation (“Delphi”) respectfully submits its comments regarding the National Telecommunications and Information Administration’s (“NTIA”) *Notice of Inquiry* (“*NOI*”) in the above-captioned proceeding.<sup>1</sup> Delphi is a leader and innovator in the design and manufacturer of vehicular radar systems, which operate in the 17 GHz, 22-29 GHz and 76-77 GHz bands, since 2001. In addition to offering its comments on the specific questions posed in the *NOI*, Delphi will discuss the unique safety benefits available from vehicular radar systems and how U.S. spectrum management policy should support their development and deployment.

**I. BACKGROUND**

According to the National Highway Traffic Safety Administration (“NHTSA”), there were over 6.3 million police-reported motor vehicle accidents in the United States, accounting for more than 3 million injuries and 42,000 deaths.<sup>2</sup> NHTSA estimates that, in 2000, the

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<sup>1</sup> National Telecommunications and Information Administration, *United States Spectrum Management Policy for the 21<sup>st</sup> Century*, Docket No. 040127027-4027-01, Notice of Inquiry, 69 Federal Register 4923 (rel. Feb. 2, 2004) (“*NOI*”).

<sup>2</sup> National Highway Traffic Safety Administration, Traffic Safety Facts 2001, 2 (December 2002).

economic impact of motor vehicle accidents, reported and unreported, reached approximately \$230.6 billion.<sup>3</sup>

Vehicular radar systems, such as those developed by Delphi, have the potential to help reduce these numbers by helping reduce the likelihood of an accident occurring in the first place or, if an accident cannot be avoided, by helping mitigate its potential severity. Presently, there are three types of vehicular safety systems based on radar technology: (1) notification to the driver of potential obstacles or collision; (2) automatic response of the vehicle, such as applying the brakes; and (3) impact protection to help lessen the severity of an unavoidable accident on the driver and passengers. Delphi's Back-up Aid (operating at 17 GHz and 24 GHz) can help detect and alert a driver to an object behind a vehicle at five meters distance. Delphi has also developed radar-enabled Adaptive Cruise Control (at 76 GHz), which automatically maintains a driver's selected speed and distance between it and a lead vehicle. Future radar systems will help detect and warn of objects at any point around a vehicle as well as initiate impact protection measures, such as tightening of seat belts, if an accident is unavoidable.

Delphi's vehicular radar systems employ a variety of waveforms, including frequency modulation continuous wave, pulse Doppler, frequency shift key, and spread spectrum waveforms using phase shift key modulation. Delphi has had vehicular radar systems based on low power, "ultra-wideband" ("UWB") techniques in production since June 2000. This product, the Delphi Back-up Aid ("BUA") radar sensor, was authorized under Part 15, subpart C of the Commission's Rules.<sup>4</sup> Delphi is also developing the second generation products under the new UWB (Part 15, subpart F) vehicular radar allocation.

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<sup>3</sup> *Id.*

<sup>4</sup> In June 2000, the Commission granted authority to Delphi to market and deploy its "UWB-like" vehicular radar systems under Part 15 as unlicensed devices pursuant to Rules 15.209 and 15.231,

## **II. VEHICULAR RADAR SYSTEMS AND SPECTRUM MANAGEMENT POLICY**

Given the clear safety benefits attributable to vehicular radar systems, these and other safety applications should be accorded the highest priority and protection in the frequencies in which they operate, regardless of whether they are licensed or unlicensed. Moreover, such high priority and protection should be made available for safety applications provided by either public safety (police, fire, medical, etc.) or commercial or private users, such as vehicular radar systems deployed on private vehicles. Accordingly, both NTIA and the Federal Communications Commission (“Commission”) should adopt spectrum management policies and rules that promote the development and deployment of vehicular radar systems in the United States.

Delphi also maintains that frequency bands used by vehicular radar systems should be protected from future disruptions or dislocations. These are emerging products in a still emerging market, and may be particularly susceptible to technical and economic uncertainties attributable, for example, to the potential relocation of the frequency bands allocated to vehicular radar systems. Such uncertainty would threaten the widespread deployment and application of these systems.

## **III. COMMENTS ON NOI**

### **A. First Objective: Facilitate a Modernized and Improved Spectrum Management System**

#### **1. Federal Government Organizational Issues**

Delphi believes that the current bifurcated spectrum management system used in the United States can lead to lower efficiency in establishing policy and in making rule changes. Implicated issues are the length of time required to coordinate rule changes, and the interaction

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47 C.F.R. §§ 15.209 and 15.231. Grant of Equipment Authorization, FCC Identifier L2C0004TR (June 1, 2000).

with international groups wherein the organization representing the United States may not be the organization responsible for making and implementing the rules. The benefits from creating a single organization to manage spectrum would be to improve the efficiency of rule changes and more clearly identify the responsible organizations. On the other hand, creating a single management organization could pose a significant risk as there would be no counter-balance to rule changes and the possibility of special interest influence of certain decisions. Certainly, two opinions from independent organizations established to serve different users can lead to discovery of an overlooked impact of proposed rule changes. Accordingly, Delphi believes that great care would need to be taken to ensure appropriate discussion and balance if a single organization were to manage U.S. spectrum policy.

## **2. Spectrum Allocation Issues**

Delphi is concerned that any spectrum management policy in the United States adequately reflects the needs and characteristics of services that help protect safety of life and property. There may be a need to maintain certain exclusive or primary allocations as required by public and private safety providers. Care must be taken to make certain that exclusive or primary use allocations are adequately used and not just reserved. In certain safety applications, adequate use does not mean continued use, but rather deployed systems that would be ready when needed as there is no ability to predict an emergency. There is also no way to ensure all secondary users would disable their systems if an emergency did occur. This problem might be particularly true in the case of unlicensed users. If primary allocations are used, a clear definition of what primary means and what risks a secondary user would be taking when establishing the conditions of secondary use is required. Moreover, Delphi believes that combining all frequency allocations into a common table and policy document would minimize



risks associated with referencing old revisions, avoiding conflicting statements, and misinterpreting data due to different formats and content of the tables.

### **3. International Issues**

It is important that the process used for establishing the U.S. position in international negotiations be clearly defined and accessible to the general public. This includes a definition of what roles NTIA, the Commission, and other governmental organizations have relative to preparing recommendations regarding international spectrum policy.

#### **B. Second Objective: Facilitate Policy Changes to Create Incentives for Achieving More Efficient and Beneficial use of the Spectrum, and Provide a Higher Degree of Predictability and Certainty in the Spectrum Management Process as It Applies to Incumbent Users**

Delphi believes that spectrum efficiency should be defined in such a manner as to best serve the quality of life of the individual citizen. Although this criterion allows much room for interpretation, it still may be made to work. The proposed paradigm shift is for the US government to “defocus” their efforts on communications. The cost advances of microwave electronics technology are rapidly making available systems and machinery that can and will significantly enhance the quality of life for the individual *outside of the communications arena*. Vehicular radar systems are a prime example of this.

Historically, use of spectrum resources improved an individual’s life solely through the use of communications. Due to continued evolutions in technology, that era is at an end. Low cost microwave technology will assist the individual in many new ways other than just for communications. Advanced automotive safety systems, such as those produced by Delphi, security devices, cooking devices, beacons for automatic factories and farms, robots of all size, scale, and function, medical equipment, and fully automated transportation systems are all examples of non-communications technology that can greatly benefit our lives, but all will need

spectrum to do so. The U.S. military, having a mission that justifies high cost by commercial standards, is an organization that has used spectrum in a variety of ways for many different ends other than just communications, and they have been doing so for many years.

The U.S. Government must take steps not to allow communications interests to “push out” or retard these other new, exciting uses of radio frequency spectrum, simply because communications was the most practical, and therefore first, use of spectrum in 1930. The communications industry is mature well beyond any of the industries attempting now to bring new uses of spectrum to the public; therefore, it is in a financial position to distort the process of best allocation of spectrum to meet the changing needs of all Americans. The use of spectrum for communications needs to be partitioned into different aspects of use, and then prioritized among the other spectrum uses. Clearly, “communications” encompasses critically important endeavors alongside “convenience” and “entertainment”, all under the “communications” name. The classic example of “critical use” of communications technology is the telephone call placed in an emergency to summon medical, firefighting, or law enforcement assistance. An example of communications “convenience” or “entertainment” is having 100 television channels as opposed to only 50 channels. Delphi believes that “connectivity”, once beyond an identifiable threshold, is less important than safety, efficiency of transportation systems, or numerous other non-communications uses of spectrum.

Delphi believes that there needs to be a determination made regarding what spectrum uses should receive priority and protection. Clearly, spectrum used for safety purposes, whether provided by traditional public safety or private entities, licensed or unlicensed, should be at the top of such a list. However, now that the aforementioned “connectivity threshold” has been surpassed for convenience and entertainment use of spectrum, other non-communications use

categories should be considered for high priority. For example, emerging wireless services will enable the modernization of the country's transportation systems and infrastructure by improving the safety of the traveling public, eliminating or reducing air pollution and lost time and other resources, and spur new avenues of commerce.<sup>5</sup> This list is not exclusive. Clearly, it is time to change the underlying rationale for spectrum use from the current "the most economically viable" to "the most important" in an open, determined, and public debate for the betterment of all Americans.

Regarding temporarily unused federal spectrum, Delphi suggests that NTIA should publish a listing of the specific spectrum that might be available. The listing should include discussion of the likelihood of future government use. If, after discussion and study, it is determined that the likelihood of future use by federal systems is low, then this spectrum should be reallocated to non-governmental use. Spectrum resources are too limited and too valuable to hold in reserve for undefined use. Conversely, care must also be given so as not to assign all available spectrum in a manner that would prevent new technology applications from emerging in the future. Some planned reserve of spectrum must be maintained for new applications. This is a very critical planning determination that must be made.

Delphi also believes that spectrum auctions are not generally in the best interest of the general public, and should be eliminated except for the bands reserved for convenience and entertainment communications. Auctions strongly favor the well-established incumbent technologies and most certainly minimize the opportunity for deployment of new technologies,

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<sup>5</sup> See, e.g., *In the Matter of Amendment of the Commission's Rules Regarding Dedicated Short-Range Communications in the 5.850-5.925 GHz Band (5.9 GHz Band)*, WT Docket No. 01-90, ET Docket No. 98-95, Report and Order, 19 FCC Rcd 2458 (2003), wherein the Commission acknowledged the important role that short range communications between vehicles and between vehicles and roadside transmitters would reduce the likelihood and severity of accidents and improve the efficiency of the country's surface transportation systems. *Id.* at ¶¶ 2-4.

even if those technologies have a direct impact on public safety, environmental improvement or some other non-communications related benefit. Spectrum should not be bought and sold because “most beneficial use” may be subjugated by the highest bidder to other uses. It is also not appropriate to have spectrum use fees except possibly for the entertainment class of use. The concepts of spectrum use fees, auctions, and leasing should be recognized as policies that engender improper utilization of this scarce national resource.

**C. Third Objective: Develop Policy Tools to Streamline the Deployment of New and Expanded Services and Technologies, While Preserving National and Homeland Security and Public Safety, and Encouraging Scientific Research**

The *a priori* classification and prioritization of spectrum use according to the greatest good for the most people, as previously outlined, should be adopted to sort out which class of service a particular proposed service would fall into. The establishment of classes of service becomes paramount in dealing with individual cases, and will further spur technology to serve society’s greatest needs. As stated previously, spectrum is a scarce national resource and as such should not be auctioned to the highest bidder, except possibly in a small portion of the spectrum rightfully allocated to convenience and entertainment services.

Construction of test platforms at public expense may not be the best technique to establish interference and band sharing criteria. A better mechanism for testing compatibility of proposed service equipment may be to do so on an incumbent’s service equipment under controlled conditions. Since the experiments would be controlled, it could be arranged so that the incumbent would suffer minimal, if any, reduction of their service capacity or quality during compatibility experiments.

Compatibility testing must be conducted in accordance with government established test criteria and test methods. Private sector laboratories should be considered for performing testing

only in accordance with the government procedures and criteria. Profit-seeking private laboratories seek to maximize efficiency. Therefore, government laboratories should be established to use as an audit control on private laboratories and to establish new procedures and tests as technology advances are made. Open, fair and generally accepted standards are critical to the testing itself. Great care must be taken to assure that the private test organizations are monitored to assure accuracy and fairness.

Incumbents need consideration and protection. Non-licensed devices also need consideration and protection, especially where safety and environmental protection applications are involved. There are many safety related applications, such as security and collision warning on vehicles, that can best be provided by means of unlicensed devices. Such devices must be able to continue acceptable operation as spectrum rules and policies are changed. However, interference protection levels must not be set on the basis of unsubstantiated claims, biased analysis, and parochial interests. The exception to (and demonstrating the benefit of) this rule would be in the case of passive sensors involved in data collection for science, where actual physical proof of a particular protection level may be impossible based on simple logic.

**D. Fourth Objective: Develop Means to Address the Critical Spectrum Needs of National Security and Homeland Security, Public Safety, Federal Transportation Infrastructure, and Science**

Delphi believes that current U.S. requirements for spectrum use are being met reasonably well considering the shared responsibility of government organizations and all of the special interest pressure. However, there is no perfect system, and there is always room for improvement. In addition, new technological developments will constantly require policy and rules changes. As previously discussed, the determination of the value of a service according to clearly disseminated and accepted criteria must be an essential part of future policy decisions.

This applies to both licensed and unlicensed applications. Delphi further believes that treatment of unlicensed devices, although adequate when initially defined, has become an issue that needs attention today and certainly will increase in importance in the future. Subjecting new spectrum allocations to auctions does not properly manage this scarce resource for all Americans. Assigning spectrum to the highest bidder is counter to the public good in the long run, and distorts spectrum use decisions that should be made after a thoughtful and careful analysis of the public interest.

#### **IV. CONCLUSION**

Vehicular radar systems, such as those produced by Delphi, hold the potential to help provide significant safety benefits to the public. Although not a traditional public safety service and authorized as unlicensed devices, vehicular radar systems should receive high priority and protection greater equal to traditional public safety services. In addition, both the NTIA and Commission should adopt policies that promote the development and deployment of vehicular radar systems in the United States.

Respectfully submitted,

By:   /s/                    

Donald R. Parshall, Jr., Esq.  
Delphi Corporation  
5825 Delphi Drive  
M/C 480-410-254  
Troy, MI 48098-2815  
(248) 813-2000

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